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Observations upon the Oral Mucosa of the African

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The oral cavity, quite apart from those structures properly included in the realm of dentistry, is of great clinical importance, for it lends itself readily to inspection and examination and, like the eye, can reflect the presence of disease in other regions.

This note describes methods of examination and the findings thereof which, although simple, have yet been found of use in diagnosis, and to some degree in following the course of certain systemic diseases, particularly of malnutrition.

It is to be emphasised that as the meaning and significance of these observations are still obscure, and much further inquiry is necessary for their clarification, theoretical considerations and implications will not be discussed.

The mucosae of the oral cavity to be considered are (a) the lingual mucosa; (b) the buccal mucosa.

The Lingual Mucosa

The lingual mucosa of the anterior third of the dorsum is easily examined and permanent records of its appearance readily obtained.

Various means of obtaining such records have been described, e.g., Oatway and Middleton (1932) and di Palma (1946). The latter's method, which is cheap, elegant and very simple, has been employed with some modifications in the investigations to be described.

The method and findings have been described in detail elsewhere (Squires, 1953, 1955). To summarise, the tongue is protruded as far as possible, cleaned with a piece of gauze, a special ink applied with another piece of gauze or a squeegee, and impressions taken by the firm application of a piece of glazed paper to the painted area. Once the impressions are dry, a process that takes only a few minutes, they are permanent.

The anatomical features thus recorded, which are shown more clearly than by any photographic method, are the filiform and fungiform papillae. The former appear on the print as round or star-shaped dots; the latter, which are smooth and pick up but little ink, and that only on the sides, as round holes in a surrounding dark background. Fig. 1 shows the appearance of a normal tongue, with even distribution of papillae.

In health there is a definite ratio between the number of filiform and fungiform papillae per unit area (4-5: 1). In malnutrition the filiform papillae tend to disappear so that the ratio is reduced. Small patches of atrophy become visible (Fig. 2). At a more advanced stage the fungiform papillae also vanish and the entire mucosa becomes disorganised (Fig. 3). Except in very advanced cases, appropriate treatment will reverse the tongue changes, and tongue prints provide a convenient means of recording mucosal regeneration (Figs. 4 and 5). Further, there is a high degree of correlation between the appearances shown on the print and the clinical findings (Squires, 1953a *supra*).

The method has been used in two ways. First, tongue prints of African children have been taken as part of routine clinical examination twice yearly over a period of several years, and are attached to each docket as a permanent record of nutritional status. This record is at least as objective as a set of symbols. Secondly, the technique has been employed as a rough screening method for school groups when clinical examination has for some reason or other proved impracticable. For such occasions an intelligent African can easily be taught the technique and the prints can be examined at leisure.

The appearances are not specific for the presence of malnutrition, as complications of certain specific diseases, e.g., cardiac and nephritic oedema, can alter the appearance of the tongue, and chronic cachectic conditions such as pulmonary tuberculosis can cause denudation of the mucosa (Fig. 6). These changes, however, seem to occur later in the history of such disorders than in the case of primary malnutrition, and the differential diagnosis is generally obvious. Further, in the case of school groups, such patients are usually too ill to attend.

Monochromatic Light as an Aid to Inspection of the Lingual Mucosa

The two varieties to be considered are ultra-violet light and sodium vapour light.

Ultra-Violet Light.—The fluorescence of the tongue induced by exposure to ultra-violet light was noted by v. d. Vergh (1928), who found that the tongue exhibited "more or less visible red fluorescence." He found that if the tongue were scraped, the surface layer, consisting mainly of bacteria, food particles and epithelial debris, exhibited fluorescence; but however

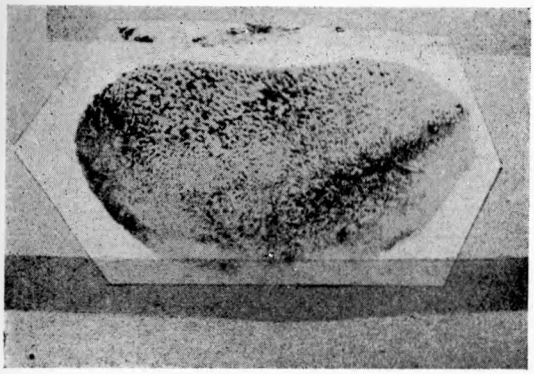

Fig. 1—Normal tongue.

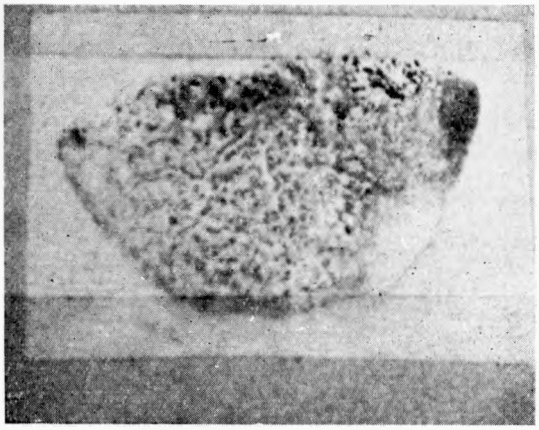

Fig. 2—Commencing atrophy.

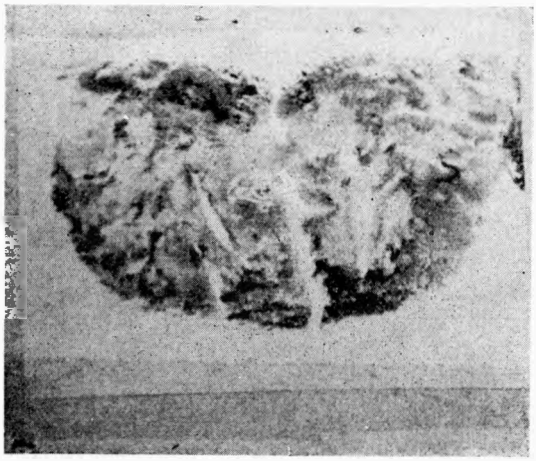

Fig. 3—Mucosal disorganisation.

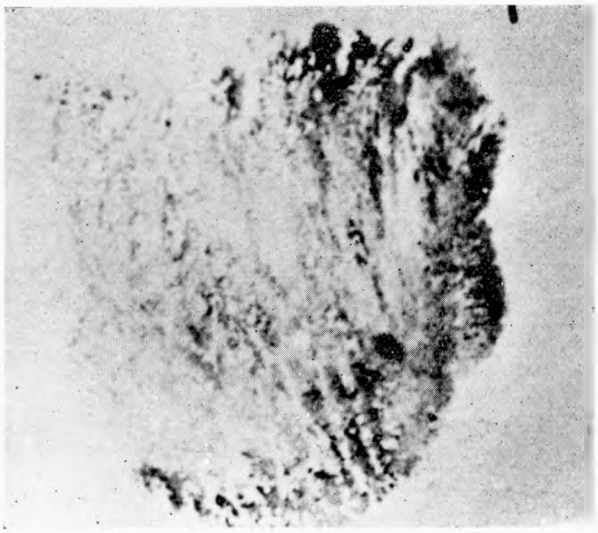

Fig. 4—Chronic malnutrition before treatment.

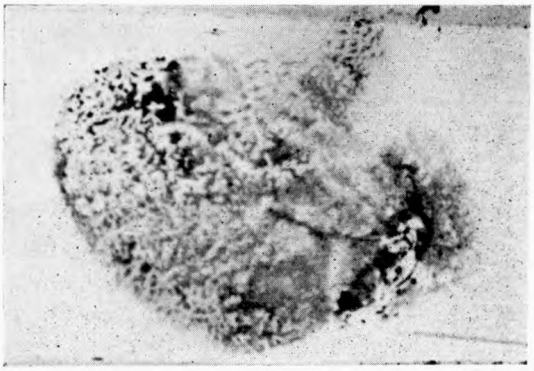

Fig. 5—Same tongue as Fig. 4. Partial regeneration of papillae. After treatment.

Fig. 6—Pulmonary tuberculosis. Regional atrophy.

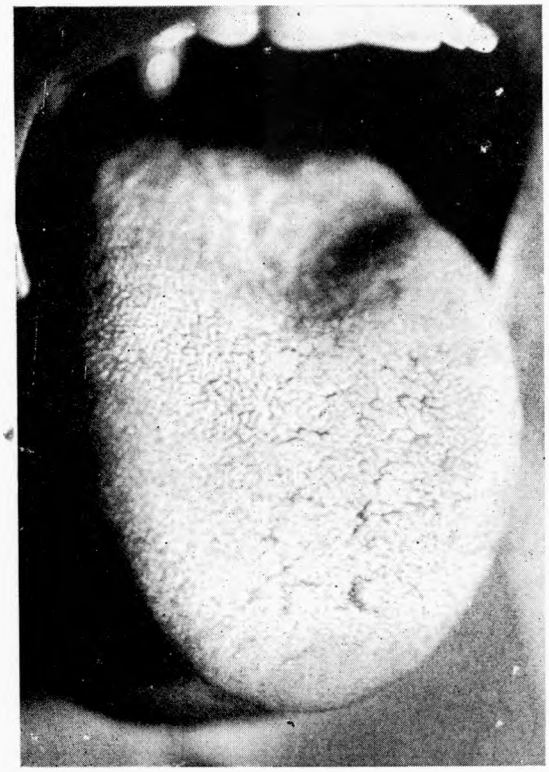

Fig. 7—Normal tongue. Sodium vapour light.

Fig. 8—Onyalai; early bullae. Sodium vapour light.

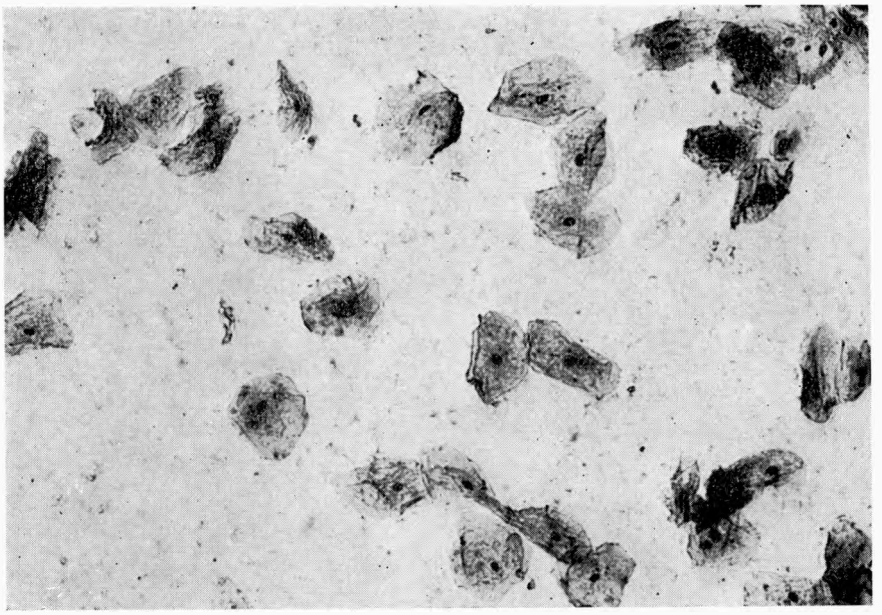

Fig. 9—Normal buccal smear.

Fig. 10—Malnutrition. Fragmentation of cells.

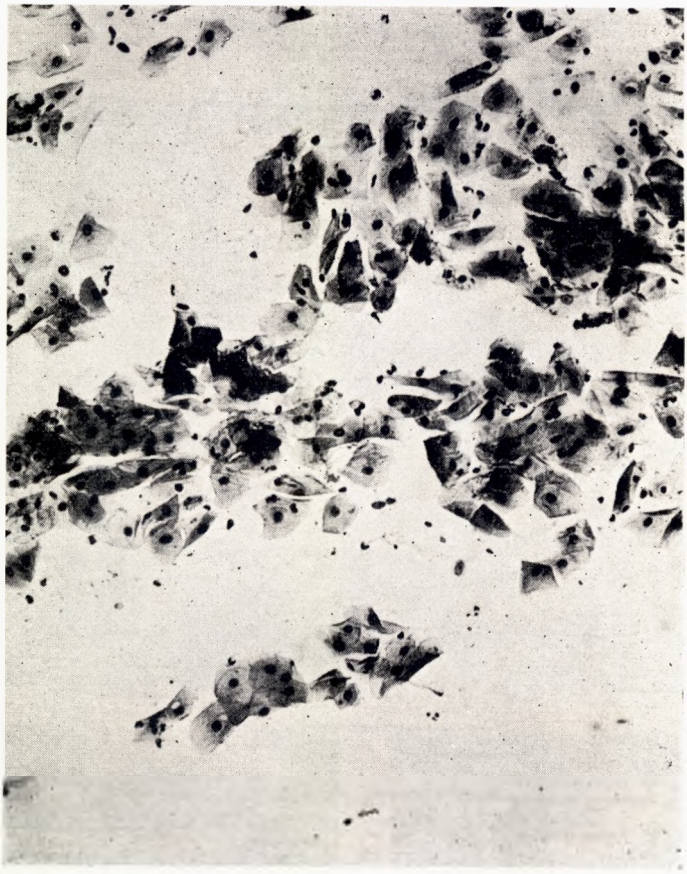

Fig. 11—Malnutrition. Cells with deeply staining nuclei and little cytoplasm.

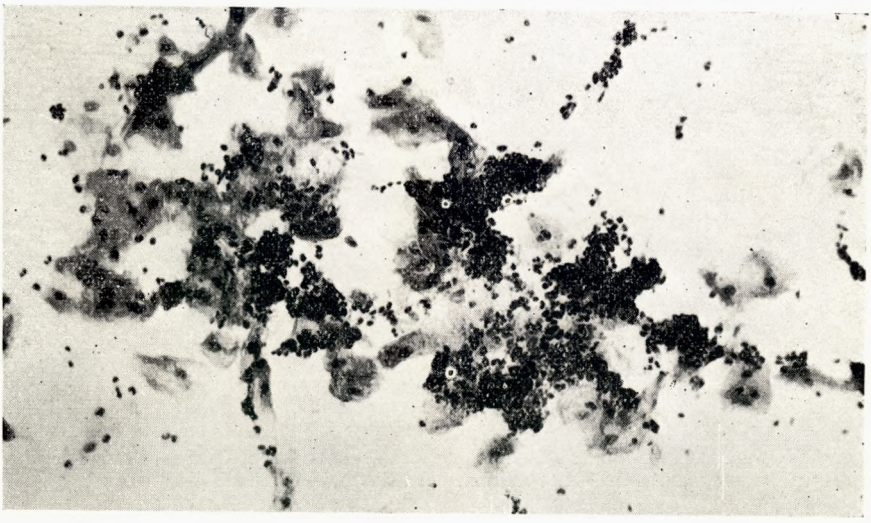

Fig. 12—Chronic rheumatic carditis. Large number of cells with deeply staining nuclei and little cytoplasm.

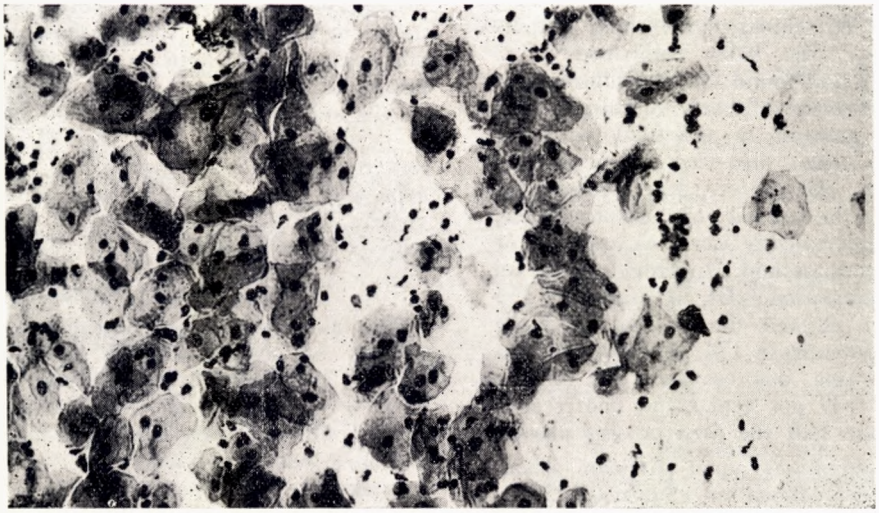

Fig. 13—Malnutrition. From same case as Fig. 4, before treatment.

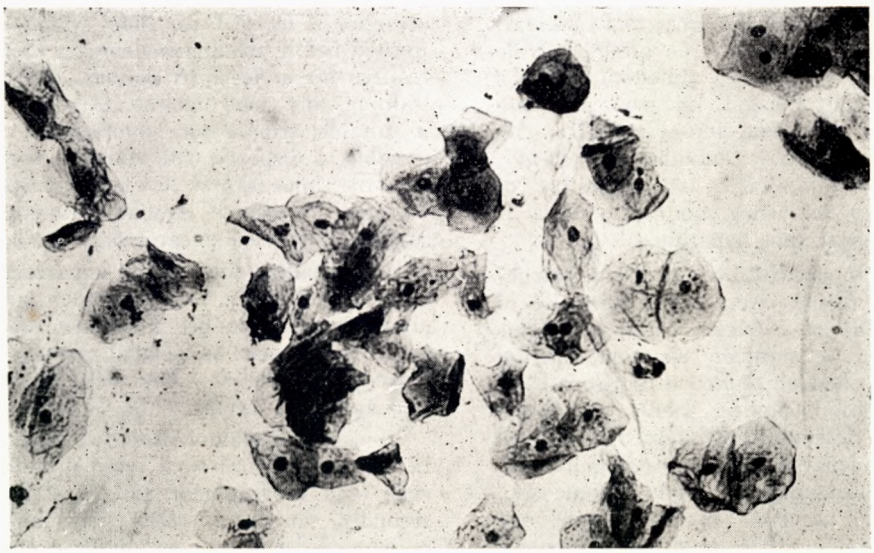

Fig. 14—Taken at same time as Fig. 5. Appearance almost normal.

vigorously and completely the tongue was cleaned, the surface still retained some fluorescence. More recently the phenomenon has been studied by Costello and Luttenberg (1944), Hagerman and Hirschfeld (1947) and Tomaczewski (1951). The latter confirmed v. d. Bergh's findings and found that the fluorescence varied considerably in different individuals. The incidence was greatest in the 0-20 year age group (89 per cent.) and least in the 81-100 year age group (47 per cent.). Tomaczewski did not estimate the intensity of the fluorescence, but merely classified his cases as positive or negative. Hagerman and Hirschfeld made an attempt at classification. Of 541 subjects, 155 (29 per cent.) showed fluorescence over the entire lingual dorsum, in 174 (32 per cent.) at least half the area was covered, and in the remaining 212 (39 per cent.) the fluorescence covered less than half the area or was absent.

Similar investigations upon African school children have been carried out (Squires, 1953b). Eight hundred and seventy-three children in the age range 7-18 years were examined. The fluorescence varied from a light red or yellow red confined to the sides and back of the dorsum to a brilliant red covering the whole dorsum down to the tip. The results were classified thus: Class I comprised those who exhibited a fluorescence extending over more than half the dorsum; Class II those whose fluorescence extended over less than half the area; and Class III, those in whom fluorescence was absent. Nine per cent. (to the nearest integer) of the examinees fell into Class I, 44 per cent. into Class II and 50 per cent. into Class III. According to Costello and Luttenberger (1944), the absence of fluorescence is suggestive of vitamin B group deficiency, but no evidence is adduced to support this hypothesis.

To test this supposition, observations extending over eight months were made upon 87 of the above series of African children. This period included a summer vacation, during which time the children tended to improve their nutritional condition (Squires, 1949). Although in the months following the return to school there was a tendency for an increasing number of previously fluorescing tongues to become non-fluorescent, the numbers involved were not significant. On the other hand, of a separate series of 38 children who presented well marked clinical signs of malnutrition, five only (13 per cent.) showed a very faint fluorescence, the remainder being non-fluorescent; so far, in subjects presenting such signs, repeated examination has shown nothing more than a feeble fluorescence at best.

Sodium Vapour Light.—Examination of the tongue by sodium vapour light is sometimes useful in picking out small lesions which might otherwise escape notice, e.g., tiny ulcers or haemorrhagic bullae. Fig. 7 shows a normal tongue and Fig. 8 the presence on the right side of very early bullae in a case of onyalai. At that time the patient complained only of headache and cacogeusia; clinically no bullae were visible, but 24 hours later they were obvious without close inspection.

THE BUCCAL MUCOSA

The taking of tongue prints requires a certain amount of co-operation on the part of the subject, and hence cannot be used with babies or very young children. As these, however, even if they will not open their mouths on request, will open them to cry sooner or later, opportunity was taken on such occasions to obtain a scraping of the buccal mucosa, in the hope that mucosal changes might be detected. This hope has been fulfilled.

The buccal mucosa, preferably at a site opposite to or higher than the line of closure of the teeth or gums (if taken lower, food debris is likely to form a large proportion of the sample), is gently scraped with any suitably sized blunt instrument and the scrapings smeared on an ordinary 3 in. x 1 in. slide, which is then immersed before the smear dries, in Papanicolaou's fixative for at least 10 minutes and dried. For staining, any good nuclear stain will serve, with a suitable cytoplasmic counterstain. It is even possible to dispense with staining, for with practice the appearances to be described can be detected by simple double illumination microscopy of the dried smear (MacConaill, 1955).

In a healthy subject the squamous epithelial cells are relatively hard to detach, and it is not always possible to get a uniform smear, as the cells often appear as isolated clumps, with a few leucocytes between. The cells are uniform in size and stain evenly (Fig. 9).

In cases of malnutrition two changes appear in the picture. First, a large proportion of the cells tend to fragment and/or stain unevenly; secondly, in many cases, especially in older patients, a large number of leucocytes and cells with deeply staining nuclei and little cytoplasm, probably lymphocytes, are plentifully distributed all over the smear (Figs. 10 and 11). Similar appearances have been observed in the specific nutritional disorders, kwashiorkor and pellagra.

The method is subject to the same limitations as the tongue prints where chronic disorders are concerned. Fig. 12 shows the appearance in a case of chronic rheumatic carditis, where the presence of many cells with deeply staining nuclei and little cytoplasm is obvious.

The technique has been tested as opportunity allowed in patients old enough to provide tongue prints as well; in the majority of cases, where the tongue print shows an abnormal lingual mucosa, the changes in the buccal mucosa are also marked. Figs. 13 and 14 were taken from the patient whose tongue prints are shown in Figs. 4 and 5, Fig. 13 being taken at the same time as Fig. 4, and Fig. 14 simultaneously with Fig. 5.

SUMMARY

An account is given of the use of tongue prints and buccal smears as an aid to diagnosis of malnutrition and in following up the effects of treatment.

The use of ultra-violet and sodium vapour light in examination of the tongue is also described.

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